

The University of Chicago

SOCIETY'S ADJUSTMENT
TO A MECHANICAL AND A SOCIAL
INVENTION

A STUDY IN SOCIAL CHANGE

A PART OF A DISSERTATION SUBMITTED TO
THE FACULTY OF THE DIVISION OF THE
SOCIAL SCIENCES IN CANDIDACY FOR THE
DEGREE OF DOCTOR OF PHILOSOPHY

DEPARTMENT OF SOCIOLOGY
DECEMBER, 1941

By
JOSEPH B. GITTLER

CHICAGO, ILLINOIS

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CHAPTER I

INTRODUCTION

It is fairly obvious that society as a complex of social relationships never stands still; it is in a perennial state of activity. The alterations in the nature, content, and structure, of groups and institutions, and in the relationships among men, groups, and institutions during a sequence of time, constitutes the field of social change.

Social change today is to be thought of as a continuous process. This does not imply that the rate of social change is always the same. There were periods of history in which social change appeared to have been quite slow. However, in contrast to geological or biological changes, social transformations often occur with amazing celerity.

In this thesis we are concerned with the relationship between inventions and social change. This is not to deny that physico-environmental, as well as biological factors play a part in bringing about changes in society. Biological and environmental factors are involved, and to some extent are responsible for, society being what it is. Man has always had to adjust himself to his physical and biological circumstances. Periods of drought, warm winters in normally cold areas, dust storms, may be responsible for an altered mode of behavior in a particular locality. Biological factors, such as disease, death, population density, prevalence of organic life, racial crossing, and so on, exert their influence upon social life. Social change, therefore, is to be thought of as resulting from a combination of physical, biological, and cultural factors which interact with each other.

It is possible to study social change from the point of view of each of these factors, separately. In the late nineteenth century, the evolutionists developed a theory of social change in harmony with the theory of cosmic and biological evolution. Spencer believed that social evolution was part of a purely "natural" process operating throughout the cosmic universe and consisted of a movement from the simple to the complex and from the homogeneous to the heterogeneous brought about by the double process of integration and disintegration.

Following Spencer, a group of thinkers who have been called "social Darwinists" formulated another theory of social evolution. Included in this group were Benjamin Kidd, Jacques Novicow, G. Vacher de Lapouge and Otto von Ammon. In general, their theory was that biological change determined social change. Social progress hinged on biological factors.

The geographic determinists, another group of the nineteenth and twentieth centuries, correlated climatic and topographical conditions with human progress. H. T. Buckle, Karl Ritter, F. G. Ratzel, Ellen S  mple, and Ellsworth Huntington were the foremost exponents of this school of thought.

However, abrupt and uneven social changes and the rapidity with which our society undergoes alteration challenged the notion of the social evolutionary process. Rather, significant social changes were conceived of as resulting from cultural innovations, or inventions. Social change which occurs through inventions, consists of the adjustments society has made and is making to cultural innovations.

By invention is meant the creation or the discovery of a new culture trait or element. It springs from a new combination and manipulation of already existing cultural elements. Social

change takes place with the introduction of this new element. Invention consists of the "process by which man modifies his relationship to some phase of his environment."¹ It is a contrivance of that which did not before exist in the same form, although most of the constituent elements were there.

Inventions tend to answer the needs of man. Some inventions answer a widespread need, while others fulfill a narrower need. But the demand for an airplane, for example, does not produce the airplane until various prior elemental inventions, such as the light motor, or refined gasoline, become realized. Therefore, in addition to the need (or what Ogburn terms social valuation), inventions are dependent upon an invention-base or on the elements necessary in the formation of the new invention.

Finally, inventiveness, or inherent mental ability becomes a third essential in the formation of new inventions. All three elements--need, cultural base, mental ability--seem to be necessary for invention to occur.

The origin, growth, and effects of inventions are all problems related to social change. Much has been written on the first two. Our concern is with the last problem.

Types of Inventions

Inventions can be classified on three bases; (1) in accordance with the degree of influence they exert after they occur; (2) in accordance with the notions of invention--combinations and invention-configurations, (these concepts are explained below); (3) in accordance with the fields or universes of knowledge in which they occur.

¹L. L. Bernard, "Inventions and Social Progress," American Journal of Sociology, XXIX (1923-24), 20.

Under (1) are found inventions ranging from those which have very important influences--or major inventions--to those of lesser and least importance--or minor inventions. By a major invention is meant the creation and appearance of a new element, which could be considered revolutionary when compared to any part of the cumulative series of traits that took part in the development of this invention. The skyscraper, consisting of such inventions as the elevator, structural steel, mechanical sewerage system, could be considered a major invention because of the consequent train of events following its adoption.

By minor inventions are meant the myriad of improvements that usually occur in connection with a major invention. Differently shaped skyscrapers, varied heights, different facades, perfected elevators, are illustrations of minor inventions. A minor invention is also one that does not lead to any or many subsequent improvements, such as, for example, the shoe-lace.

By invention-combination (under 2) is meant the combination of the various inventions and contrivances that were brought together to form one major invention such as the elevator. There are many kinds of elevators. However, although they are different, they retain a common fundamental similarity, and it is this that permits us to refer to it as an invention-combination--a major invention which, though it may vary in form, retains its fundamental characteristics and structure consisting of a combination or fusion of other inventions.

By invention-configuration is meant the cluster of inventions that tend to be related to each other in so far as several different and independent inventions converge and in so doing bring about a pattern of inventions. It consists of a group of associated inventions that make up a cultural pattern. The automobile-

configuration consists of many co-operating inventions such as the automobile, the gasoline station, hard-surfaced roads, the trailer camp, and so on. The college women's configuration consists of the pattern of sorority row, women students, college campus, fashions, classroom, and so on.

Under (3) there might be included mechanical, social, pure aesthetic, method, or other inventions, falling under the accepted divisions and fields of knowledge in which they occur. Several writers (Ogburn, Wilson Wallis, Hobhouse, Wheeler, and Ginsberg) classify types of inventions in accordance with their dichotomous classification of culture, into material and non-material aspects. Mechanical invention may be defined as the creation of a new material or technological implement or tool. "It is a process by which, normally, the organism which directs the machine or device invented--not necessarily the inventor--employs natural forces to secure a better, that is, usually a more rapid and economical and more accurate, adjustment to his physical environment."²

A social invention is an invention in the non-mechanical realm. Social inventions consist of the creation of new relationships between the individual and the group, and between groups, by the employment of social forces and social situations. Social inventions are related to social organization. In social invention, man manipulates man. In mechanical invention, man manipulates nature.³ Examples of social inventions are old-age pensions, higher education for women.

²Bernard, op. cit., p. 6.

³The similarities or differences between a social invention and a mechanical invention might be discussed to the length of a volume, but this would be beyond the purpose of this introduction. A social invention is here used as a new element in social organization.

This thesis will trace the social influences of a mechanical invention-combination, the elevator, and a social invention-combination, higher education for women. It is our purpose to discover the factual and specific influences of each invention of society as well as the nature and kinds of processes involved in their impacts on society. Whether the processes of a mechanical invention are essentially the same or different, will be another of our interests.

That inventions, particularly technological inventions, have important influences on society has long been recognized. As early as 1843 a Phi Beta Kappa oration was delivered at Brown University by Job Durfree on the topic, "Influence of Scientific Discovery and Invention on Social and Political Progress."⁴ In the same century Karl Marx and Friedrich Engels proceeded to account for social change as being predominantly the result of changes in the methods of production. As Engels put it, ". . . . the production of the means to support human life and, next to production, the exchange of things produced, is the basis of all social structure.....The final causes of all social changes and political revolutions are to be sought, not in men's brains, not in men's better insight into eternal truth and justice, but in changes in the modes of production and exchange."⁵

No attempt is made here to enumerate the entire literature on social implications of inventions. A few are mentioned to illustrate what has been done. The literature has been of several types. There has been much written on the social effects of the

⁴In Representative Phi Beta Kappa Orations, ed. by C. S. Northrup, et al., 1915, pp. 43-75.

⁵Friedrich Engels, Socialism, Utopian and Scientific, tr. by Edward Aveling (Chicago: Charles H. Kerr & Company, 1900).

Industrial Revolution. One of the most interesting of these works is The Rise of Modern Industry which traces the social effects of industry in a rather general fashion.⁶ Other studies such as those by Joseph Folsom, Hazel Kyrk, and G. H. Berry, have been made dealing with the effects of inventions on specific institutions, such as the family;⁷ however, it was not until recently that systematic attempts were made to study empirically, the social influences of specific mechanical inventions.

One of the recent attempts made in tracing the social implications of a mechanical invention was by John H. Mueller.⁸ In his study, he considered the introduction of the automobile as a social force calling for adjustments. After dealing with the history and spread of the automobile, the author discusses the effect of this invention on mobility, on rural organization, on urban life, and as a factor in personal and social disorganization in so far as it contributes to accidents. Social response is traced. The point is made that the opposition to the automobile brought about a series of legal controls over the use of the automobile. Finally, the response or adjustments to the automobile are reduced to three types: (1) ordering and forbidding (which sought to expel the foreign object which was associated with unpleasant symptoms); (2) exhortation and ridicule; (3) toleration, criticism and a scientific attitude. These he found, follow in a sequential, chro-

⁶J. L. and Barbara Hammond, The Rise of Modern Industry (New York: Harcourt, Brace and Co., 1926).

⁷Joseph K. Folsom, The Family (New York: John Wiley and Sons, 1934), pp. 180, 188-214; Hazel Kyrk, Economic Problems of the Family (New York: Harper Bros., 1933), p. 132 ff.; G. H. Berry, "Mothers in Industry," Annals of American Political and Social Science, CXLIII (1929), 315-23.

⁸John Henry Mueller, "The Automobile: A Sociological Study" (Unpublished Ph.D. dissertation, Department of Sociology, University of Chicago, 1928).

nological order to form what he called a "hypothesis of the natural history of public opinion."

Walter Prescott Webb in his book The Great Plains has taken a region and developed the thesis that this geographical area with its peculiar problems could not have been settled as other parts of the United States were. He brings evidence to prove that it was technology which made the settlement possible. The effect of this settlement on various institutions are traced. Dr. Webb found three mechanical inventions largely responsible for the settlement of the Plains. These were the six-shooter, barbed wire, and water inventions (windmills, irrigation, and dry farming).⁹

Another study made by Elizabeth Baker deals with the technological changes made in the printing industry as well as the effects of these changes upon labor.¹⁰ A description of the growth of press inventions, their adoption, and the changed function of the pressmen, are given. Case studies of the men who lost their jobs when new machinery was introduced in the plant are presented. The problem of employer-employee relationships and the rise of organized labor in this group are also discussed. For the most part, this very thorough work traces the economic changes brought about by the introduction of new technological techniques. The sociological implications of the problem, however, are very sketchily presented.

Dr. Gilfillan, in Inventing the Ship, discusses the numerous inventions of the ship as well as the conditions generating

⁹Walter Prescott Webb, The Great Plains (New York: Ginn and Co., 1931).

¹⁰Elizabeth Faulkner Baker, Displacement of Men by Machines: Effects of Technological Change in Commercial Printing (New York: Columbia University Press, 1933).

the discoveries that changed the structure of ships. The social effects of the introduction of these new inventions are not treated fully. Generalizations are made, however, regarding conditions of invention. These are divided into seven fields; namely, the nature of inventions; changes evoking invention; the rate of growth and life cycle of an invention; factors fostering, retarding, and locating invention; principles of chance; inventors and other classes, and tendencies in the craft; and effects of invention. Under the last category invention process is discussed rather than the processes involved in the social influences of invention.¹¹

In the Conquest of Culture, M. D. C. Crawford traces in an entertaining but superficial manner, the culture of various peoples from earliest times up to the present. Some attempt is made to evaluate the changes in technological techniques and their consequent social influences in four major industries--cloth, tobacco, iron, and transportation. The method used is historical and descriptive and no sociological generalizations are made. The author touches on the concept of social inventions which he defines as inventions in the non-mechanical realm. The two social inventions treated are the devil, and war. Both of these are essayistic rather than empirical. The book is popularly written and sheds no new light upon the problem of invention and social change.¹²

An interesting study was made by Bernard Brodie on the impact of new technological inventions in naval warfare on power politics. The writer traces the transformation of naval equipment during the last hundred years and the subsequent effects upon the

¹¹S. C. Gilfillan, Inventing the Ship (Chicago: Follett Publishing Company, 1935).

¹²M. D. C. Crawford, The Conquest of Culture (New York: Greenberg, 1938).

maritime power of nations. No generalizations in regard to inventions and their effect on power politics are made. A description of the changes in battle strategy necessitated by the introduction of new inventions as well as the shifting of advantages to certain nations who employed these inventions are lucidly presented. The sociological implications of this study are not developed.¹³

In Technology and Society the Rosens deal with the development and adoption of technological methods in various fields such as manufacture, professions, construction, and transportation. They then trace the general economic effects springing from mechanization, the effects on labor and unemployment, on the farmer, on the development of urban communities, on the family, on human welfare, and on government. The influences of no one invention have been fully traced nor have the processes involved in the impact of invention on society been isolated.¹⁴

Several studies on the problem and effect on technological development on society have appeared under the sponsorship of the federal government. One of the first of these consisted of an attempt to gather material on the social effects of the radio.¹⁵ Another discussed the advancement made in agriculture, mineral industries, transportation, communications, power, chemical industries, electrical goods industries, metallurgy, and construction

¹³Bernard Brodie, Sea Power in the Machine Age (Princeton University Press, 1941).

¹⁴S. McKee Rosen and Laura Rosen, Technology and Society (New York: Macmillan Company, 1941).

¹⁵W. F. Ogburn, "The Influence of Invention and Discovery," in Recent Social Trends (New York: McGraw-Hill Company, Inc., 1933), pp. 153-56.

industries.¹⁶ In this latter study the general effects of machines in the fields of labor, education, entertainment, and law are mentioned but no one invention and its social influences is handled. Lastly a large series of monographs inquiring into changes in technology in various industries and the effects of these changes on the volume of employment and unemployment have appeared.¹⁷

It has been widely recognized, therefore, that technological innovations have exerted great influence on our material as well as on our non-material cultures. However, inventions in the non-material realm, have also effected social changes. It is for this reason that we selected a social invention along with a mechanical invention in our study of the relation of inventions and social change.

Social inventions have not been studied in the manner here proposed. There have been numerous essays, economic studies, and historical works whose subject has been that of social inventions. The method used in these works has been largely historical and speculative. In this study an attempt will be made to discover in general terms the processes by which a social invention impinges on society.

A brief survey of the field of social inventions concerning women reveals the paucity of data available. Such an important social invention as the woman's club has been treated comprehensively in only one study which is purely an historical study

¹⁶Technological Trends and National Policy, Report of the Subcommittee on Technology to the National Resources Committee, June 1937 (U. S. Government Printing Office, 1933). Also Technological Trends in Relation to Agriculture, *ibid.*

¹⁷National Research Project on Re-employment Opportunities and Recent Changes in Industrial Techniques, Works Projects Administration.

of the organization.¹⁸ No attempt is made to discover the influence of this invention on institutions, customs, and so on.

Another work which touches upon the influences of a social invention is Maud Nathan's book which details the history of the National Consumer's League established to better working conditions for women.¹⁹ The resistance to this invention as well as some of the changes it wrought in the economic field are discussed. No attempt was made to trace influences in other fields.

Woman's suffrage has been treated in any number of works but here again the treatment has been largely in the form of tracts. These works would be too numerous to mention.²⁰

There are many studies on the economic aspects of working women made by the Women's Bureau of the United States Department of Labor. These treat with the economic aspect of the social invention of women working in industry. Their emphasis is largely upon work hours, wages, compensation, unemployment, and so on.²¹

An interesting research study was made at Columbia University on the effect of many inventions on one invention. This work called Social Change in Relation to Curricular Development

¹⁸ Mrs. J. C. Croly, The History of the Woman's Club Movement in America (New York: Henry G. Allen and Co., 1898).

¹⁹ Maud Nathan, The Story of an Epoch Making Movement (New York: Doubleday, Page and Co., 1926).

²⁰ Villiere Brougham, The Case for Woman's Suffrage (London: T. Fisher Unwin, 1907); Eugene A. Hecker, A Short History of Woman's Rights (New York and London: G. P. Putnam's Sons, 1914).

²¹ Ethel L. Best, Conditions of Work in Spin Rooms (Washington: Government Printing Office, 1929); Mary Elizabeth Pidgeon, Women in 5-and-10 Cent Stores and Limited-Price Chain Department Stores (Washington: Government Printing Office, 1930); Emily C. Brown, A Study of Groups of Denver Married Women Applying for a Job (Washington: Government Printing Office, 1929); Eleanor Nelson, Women at Work (Washington: Government Printing Office, 1934); Louise Moores, College Women in Business (New York: American Management Association, 1927).

in Collegiate Education for Women, treats the influences of such inventions as women in occupations, woman's suffrage, and other inventions concerning women; on college curriculum.²²

From this short survey of the field of mechanical and social inventions, it is clear that there have not been many widespread studies on the relation of invention to social change. Mechanical inventions have been recognized as having social importance. Slowly, a large body of knowledge of the relation of technology and social change has been built up. We know a great deal about how mechanical inventions accumulate and impinge on society. How social inventions influence society, how they accumulate, how each fans out and exerts its multifold influences upon society--these problems and aspects of social inventions are little known. In Dr. Ogburn's writings are found the most extensive studies of the operations and processes involved in the social influences of any type of inventions.

With this in mind the writer has attempted a threefold task. The first will consist of the specific social influences²³ occurring as a result of the introduction of a mechanical invention, the elevator, and of a social invention, higher education for women. The second will endeavor to isolate the processes involved in the impact of each of these inventions on social institutions, on customs, attitudes, on behavior, and on other inventions. Which of these processes are characteristic of each of

²²Grace Ruth Foster, Social Change in Relation to Curricular Development in Collegiate Education for Women (Fairfield, Maine, The Galahad Press, Inc., 1934).

²³Social influence is here used to signify a relation or interrelation between an invention and society. It does not necessarily signify a causal connection between the two; it connotes the forms of adjustments society has made to the invention.

these types of inventions and which are not will constitute our final inquiry.

The influences of the elevator are handled in Part I, starting with Chapter II; those of higher education for women in Part II, starting with Chapter X. In the concluding chapter are presented a summary of the factual findings together with the conceptual framework involving the general types of influences and types of processes by which society has been found to adjust to both the social and the mechanical inventions, that is, the ways in which inventions impinge on society.

CHAPTER XIX

SUMMARY OF FINDINGS AND CONCLUSIONS

In the first chapter it was pointed out that an invention, when adopted, results in some disorganization and subsequent societal adjustments. The chapters that followed described the specific adjustments that were made to a mechanical invention (the elevator) and to a social invention (higher education for women). In this concluding chapter, a summary of the empirical and factual findings of society's adjustments to these inventions, as well as a delineation of a conceptual framework, including generalizations as to types of influence and types of processes involved in the congerie of adjustments, will be given.

The intention of the study was to discover what actually occurs when society adjusts itself to inventions. This problem has given rise to much speculative thinking both by the sociologist and the layman. The writer attempts to ascertain the processes which occur when society is faced by a new invention, accepts it, and finally makes it a part of its culture. For this reason two inventions were chosen--one in the mechanical realm, the elevator, and the other in the social realm, higher education for women. In themselves, neither of these two inventions are deeply significant for the sociologist. They were selected because both of them had passed through the stages of introduction, acceptance, and spread. Data were available in a form that could be handled and it was possible to follow out their ever increasing relationships into all fields. Since we were interested in the scope of the influences, many facts were brought to light which were un-

known heretofore; on the other hand, some of the facts discussed appear to be rather obvious. Hence the foregoing summary which contains only a statement of the factual findings on the relationship of society to these two inventions may be of interest only to those who are concerned with the elevator or higher education for women. However, some contribution to the knowledge of the processes involved in society's adjustment to inventions was derived from the study of these particular inventions. How these processes were derived from the data can be ascertained by reference to the textual material since the summary by its very nature could indicate the facts only. Following the summary the writer has generalized on the nature of the social adoptive process of invention and its relation to the field of social change. The author hopes that the processes that have been isolated will prove useful to the further study of social change.

The following list of influences include only those influences of each invention for which factual evidence was presented in the text. Many more derivative influences might be inferred from the data but these are not listed since the writer wished to include only those which were clearly established.

Summary of the Factual Findings of Society's Adjustment to the Elevator

I. Social reception of the elevator.

- A. Fear of accidents and the lack of knowledge of the operation of the new invention were the main reasons for opposition.
- B. Opposition to its adoption also took the form of ridicule.
- C. Resistance to the adoption of the elevator disappeared when improvements providing greater safety were introduced.
- D. There has been steady increase in the number of elevators in use in the United States since its inception.

II. Social reception of the skyscraper.

- A. There was opposition to the skyscraper in the beginning due to its novelty.
- B. Questions of personal safety and health were other reasons for resistance.
- C. Opposition also arose due to the personal caprices of persons in power to resist effectively the spread of the skyscraper.
- D. At first the opposition took the form of ridicule; later resistance was based on scientific argument.
- E. The consideration of skyscrapers as a source of civic prestige and pride aided its later adoption and spread.
- F. The larger the population of the city, the greater the number of tall elevator buildings in the United States.
- G. There appears to be a distinct trend in the spread of tall elevator apartment buildings in cities in the United States.
- H. Elevator apartment buildings do not tend to run as high as commercial buildings with elevators.
- I. In the United States (1929), in 173 cities of 50,000 or more people, 74 or 42.8 per cent had elevator buildings of ten stories or more.

III. The elevator in relation to the family.

- A. The median size family in tall elevator apartment dwellings in Hyde Park is smaller than the median size family living in one family and row dwellings, two family and double dwellings, three family dwellings, and other multifamily dwellings.
- B. Recreational activities of children living in elevator apartments are adjusted to this form of dwelling.

IV. Economic relations.

A. Relation to land values.

- 1. High land values contributed to the spread of skyscraper buildings.
- 2. Tall buildings and land values exert a reciprocal influence on each other. High land values re-enforce the spread of tall buildings; tall buildings tend to raise land values on land adjacent to them; other high buildings result.
- 3. The value of land on which the skyscraper is erected usually increases. This sometimes happens on adjacent land.

B. Relation to business and industry.

- 1. The introduction of the elevator opened a source for

the investment of capital and the organization of business to deal with the distribution of the elevator.

2. Insofar as the elevator has made the skyscraper possible, it has opened channels in building investments amounting to a degree unheard of before the advent of the skyscraper. Some skyscrapers are valued as high as fifty million dollars.
3. The elevator manufacturing industry in the United States reached the multi-million dollar level as early as the last two decades of the nineteenth century.
4. The United States has led the world in the manufacture of elevators and elevator machinery.
5. The value of manufactured elevators and elevator equipment is but a very small part of the value of manufactured machinery in the United States.
6. The value of United States exports of passenger and freight elevators goes into millions of dollars yearly.
7. In set-back skyscrapers, elevators limit the "economic height" of buildings.
8. Rents usually rise with height in an elevator building.
9. Apartments in tall elevator buildings tend to have, on the average, higher rentals than apartments in other types of buildings.
10. The cost of electric elevator operation is lower than that of any other power elevator.

C. Relation to labor.

1. The elevator invention opened new fields of occupations.
 - (a) Those engaged in the manufacture of elevators and elevator equipment.
 - (b) Elevator sales people.
 - (c) Elevator operators, including men and women.
 - (d) Elevator starters.
 - (e) Special elevator inspectors in large cities.
 - (f) Specially trained window cleaners.
 - (g) Insofar as skyscrapers are sightseeing centers, special guides and workers are usually trained to inform the sight-seers.
2. It has opened further sources of employment for already existent occupations such as accountants, miners, engineers, and so on.

3. The elevator allows the routing of laborers into distinct patterns of a working schedule.
4. It enabled organization of elevator employees into unions consisting of elevator constructors, operators and starters.
5. Large scale elevator strikes were conducted by the unions.
6. The elevator union strike affected 250,000 non-elevator workers in New York City by keeping them from their work.
7. The elevator strike led to the further adoption of accepted labor mediation methods.

V. Relation to urban way of life.

- A. Elevators in large cities, such as Chicago, have become an integral part of the inhabitants' lives if the extent of the use of elevators is noted.
- B. It is becoming more and more customary for people to use the elevator for travelling vertical distances which come easily within the range of walking possibilities.
- C. The elevator joins with the skyscraper and many other inventions to produce the ecological organization of the city.
- D. Families living in tall elevator apartment buildings of Hyde Park tend to move more frequently than those in one family, two family, and three family dwellings and not as frequently as those in more than three family dwellings and those in hotels and apartment hotels.
- E. Living in skyscraper apartment houses is a factor in establishing impersonal relationships in cities.
- F. In buildings with a large elevator traffic, elevator travel was conducive to a change in manners such as having men keep their hats on in the presence of women in the same car.

VI. Relation to health.

- A. There are maladies characteristic of the occupation of elevator operators, such as flat feet, varicose veins.
- B. The use of elevators may be thought of as the necessary though not sufficient cause of elevator accidents.
- C. Upper stories in skyscrapers supply more fresh and pure air than lower stories. The same is true of sunlight.
- D. Insofar as house flies, mosquitoes, and blow-flies tend to live in low altitudes, other conditions being constant, persons in high stories are less often subjected to attack by these disease-carrying insects.
- E. Cities like New York produce noises to an injurious degree.

Dwellers on the upper stories of tall buildings are not less liable to the noises of the street than those on lower floors except on stories higher than surrounding buildings or opposite and above set-backs.

VII. Relation to law and political organization.

- A. The elevator led to the formulation of an expert safety code governing the operation of elevators.
- B. It led to city ordinances incorporating the provisions of the code.
- C. It also led to the setting up of municipal administrative bureaus in large cities to supervise the activities of elevator inspectors.
- D. It led to licenses for running elevators which in turn act as a source of city revenue.
- E. The skyscraper led to the establishment of zoning laws regulating the heights of buildings.
- F. Skyscrapers led to the special training of municipal firemen.
- G. Skyscrapers called for strict enforcement of fire-prevention ordinances.

VIII. Relation to other mechanical inventions.

- A. The elevator fused with other inventions to produce the skyscraper.
- B. Skyscrapers are of many types to suit the need: office buildings, apartment buildings, hotels, hospitals, tower of learning.
- C. The need for saving space in skyscrapers led to improvements of the elevator: higher speed elevators, double-deck elevators, two-cars-in-one shaft.
- D. Special types of elevators have been invented to suit special types of businesses, such as large department stores.
- E. Skyscrapers necessitated the use of special apparatus for window cleaning.
- F. The skyscraper makes for the further adoption and use of fireproof building materials.
- G. The skyscraper made for changes in fire-fighting apparatus.
- H. The elevator was modified to provide for:
 - 1. Buildings for vertical parking of automobiles.
 - 2. Escalators.
 - 3. Dumbwaiters.

4. Elevators suitable for use in ships.
 5. Hospital elevators.
 6. The operation of very large warehouses.
 - I. The elevator makes use of the photo-electric cell for automatic operation.
 - J. Curved-rail elevators help with the construction of airships.
- IX. Miscellaneous interrelations.
- A. The elevator has made available forms of recreational activities to persons heretofore excluded, such as elevator connections to hotels on mountains, elevator service in places like the Carlsbad Caverns in New Mexico which entail a steep descent and ascent.
 - B. The elevator and skyscraper were used as subjects and motifs in literature, painting, and in music.
 - C. The skyscraper led to controversial schools of architecture.
 - D. The elevator led to the Elevator Engineering College, New York.
 - E. The elevator led to student training courses established by various elevator construction firms.
 - F. Many books and articles have appeared on the technical aspects of the elevator.
 - G. The skyscraper is used as a sight-seeing observatory.
 - H. Roof and terrace gardens came with skyscrapers.
 - I. The skyscraper contributed to the stock of American vaudeville humor in the early nineteen hundreds.

Summary of the Factual Findings of Society's
Adjustment to Higher Education for Women

- I. Social reception of higher education for women.
 - A. Resistance to the invention was due to the belief in the mental and biological inferiority of women.
 - B. Resistance was also due to conservatism, the opposition being directed against a change in the status of women.
 - C. College women were ostracized in "polite society."
 - D. College women were considered to have lost all feminine appeal.
- II. Relation to marriage and the family.

A. To attitudes towards marriage and the family.

1. The attitudes of college women towards various aspects of the marriage relationships reflect the general change in the marriage mores characteristic of the present era. (Few women prefer the old-fashioned dowry system; college women are almost unanimously in favor of equal status for husband and wife; there is little opposition to divorce "when necessary.")
2. The early accusations of the nineteenth century that college makes women opposed to marriage and a family life are false.
3. Contrary to popular opinion, college women tend to prefer marriage and motherhood to independent careers.
4. College women, in significant numbers, desire a dual situation of marriage and career. This, of course, may be true for other women too.
5. From several questionnaire studies made in various colleges, college women seem to want from two to three children.

B. To the selection of a mate.

1. The choice of marital circumstances is more deliberate than that of uneducated women. They prefer higher economic, intellectual, and "social" standards.
2. There is a tendency for college women to marry college men.
3. Coeducational colleges are more conducive to college women marrying college men than are women's colleges.
4. College women tend to stress the desire for a husband of high intellectual calibre.

C. To the rate of marriage of college women.

1. While the marriage rate among the earlier college alumnae (prior to the twentieth century) was low, more recent studies show a trend towards a considerable increase in their rate of marriage.
2. The marriage rate of women from coeducational institutions tends to be higher than those from women's colleges.
3. The marriage rate among college women varies with the sections of the country.
4. The marriage rates of college educated women are lower than those of the general female white population of the United States at comparable ages.
5. The marriage rate of college women is lower than that of college men for comparable ages.

6. The marriage rates for women with advanced degrees are lower than those with undergraduate degrees.
7. From the studies presented we cannot conclude that college education was directly responsible for the non-marriage of unmarried alumnae.
8. The marriage rate of Vassar alumnae is lower than that of graduates from preparatory and finishing schools--that is, of those with similar social backgrounds.

D. To the age at marriage.

1. Compared with the native white female population, college women show a definite tendency to marry later.
2. Recent college alumnae tend to marry earlier than graduates of previous years.
3. Women who take graduate work marry, on the average, later than those with baccalaureate work only, as would be expected.
4. College women tend to marry later than non-college women from similar socio-economic strata.

E. To the birth rate.

1. It was found that college education has a low correlation with the use of contraceptives. The use of contraceptives seems to be correlated more with economic factors. However, it does appear plausible that a college woman would be in a better position to acquire contraceptive information than non-college women.
2. Married college women tend to have fewer children than white urban married women of the same age groups.
3. The number of children per married college woman is slightly lower than the number per married non-college woman with very similar social backgrounds.
4. Married college women who have children tend to have more children per year of marriage than their married non-college relatives, sisters, and friends.
5. There are more childless marriages among college women than among married non-college women with similar social background.
6. Married mothers with advanced degrees have on the average fewer children than married women with baccalaureate degrees.
7. Married women with advanced degrees have a higher percentage of childlessness than married women with baccalaureate degrees.

F. To success or failure in marriage.

1. The divorce rate among college women is lower than that of the general married population in the United States and lower than the divorce rate of the general married population in their respective regions in the United States.
2. Education of women beyond high school seems to be conducive to happiness in marriage.

III. Economic interrelations.

- A. Women's colleges involve tremendous financial investments in land, buildings, teachers' salaries, equipment, tuition fees, and so on, as might be expected.
- B. College tends to select women students from the upper economic groups.
- C. The approximate average yearly expense of one year in college for a woman is \$500, including tuition, room and board and fixed fees. This is an outlay of money for women's education which did not before exist.
- D. The average yearly college expenses for women tend to increase with the matriculation in the following types of colleges respectively: state universities, large coeducational private institutions, large private women's colleges.
- E. When women entered colleges numerous scholarships and fellowships were established for them specifically.
- F. The loan funds which were established for new students have been partially diverted to the use of women students; women students also share equally in the federal aid made available to needy college students.
- G. Although college women tend to desire marriage, they seek, as a close second, opportunities to enjoy economic independence.
- H. In the last decades, an increasing number of vocational opportunities have opened up for college women. That is, those fields that usually require college preparation have become available to, and are admitting, in increasing numbers, college women.
- I. College women may now apply for federal civil service jobs previously open to college men only.
- J. College women tend to enter teaching in greater numbers than any other vocation.
- K. New vocations have been created for women with a college education. Deans of women are one example.
- L. College women have entered the professions of law, divinity, medicine, journalism, social work in increasing numbers.

- M. College women tend to enter the professional occupations more than any other type of occupation.
- N. There tends to be a close relation between the type of first employment of college women and their major work in college.
- O. The earning capacity and income of college women places them in the upper forty per cent of the income groups in the United States.
- P. The college woman tends to command a higher salary than a non-college woman in a similar occupation.

IV. Relation to personality.

- A. There appears to be a distinct college "co-ed" type.
- B. The college girl as a social type has gone through three distinct phases corresponding to the three periods in the history of higher education for women. The first was the unmarriedable, career-seeking, socially-minded woman; the second, in the nineteen twenties, the "rah-rah" type, the third (present type), the "casual" type.
- C. The college "co-ed" wears distinct clothes, uses a unique idiomatic form of speech, and possesses a characteristic pattern of social standards.
- D. Much evidence has appeared to show that the average college girl has become taller and heavier than the former college girl.

V. Adjustment problems of college women.

- A. Unique and particular adjustment problems present themselves to the girl in the process of maturation in a college environment.
- B. Often there is an adjustment problem arising from a conflict between the moral standards of her home and those she finds among college friends.
- C. Adjustment problems of college women involve homesickness, disillusionment in college, financial worry, worry about grades, neuroticism, problems connected with courses of study, problems of teacher-student relations.
- D. Senior women either have more problems of adjustment or are more vocal about their problems than lower class women.
- E. Some evidence appeared that points to the greater incidence of homosexuality among graduates of separate women's colleges than among alumnae of coeducational institutions.

VI. Relation to various social attitudes.

- A. College women tend to be slightly more conservative in their religious attitudes than college men.

- B. College women have a positive attitude towards religion.
- C. Upper class women tend to be more liberal in their religious views than lower class women.
- D. Senior women are more liberal on moral questions than freshmen.
- E. College women tend to have liberal attitudes towards sex questions.
- F. College tends to make women more liberal and internationalistic in their political outlooks.
- G. Senior college women show a slightly more liberal attitude towards the Negro, than freshmen.
- H. Specific courses affect students' attitudes on various social questions. The direction of this influence depends on the teacher and on the books used.

VII. Relation to recreation and amusements.

- A. College women are very active in many extra-curricular activities which vary greatly in type and number from student to student, and from college to college.
- B. The college woman has special interests of a more humanitarian and intellectual nature than her non-college sister.
- C. College women tend to read more books than their friends without a college education.
- D. The college woman attends the legitimate theatre more than the non-college woman.

VIII. Relation to voluntary associations.

- A. College has given rise to social sororities.
 - 1. Sororities tend to set their members off from non-sorority students on the campus.
 - 2. Rivalry among sororities for members has provided one more source of social competition.
 - 3. Sororities possess rituals, songs, cheers, emblems, and other insignia of recognition, which set them apart as a social group (voluntary association).
 - 4. Sororities are affiliated in a national organization.
- B. College alumnae have organized themselves into the A.A.U.W.
- C. Other organizations.
 - 1. Women's professional sororities.
 - 2. College women's honor societies.

3. College alumnae organizations.

4. Athletic conferences.

IX. Higher education for women has not had any startling effect on the general college curriculum. A few changes took place to accommodate the women: physical education for women, courses in home economics, fine arts, the family, dancing, and so on.

General Types of Influences and Processes Involved in the Framework of Adjustment

[Science] must be more than a collection of facts, even if they are organized according to some external order, such as the alphabetic or chronologic one. The ideal of science is to see the facts logically connected according to their essential nature, summarized in some small number of connecting laws or principles.¹

The facts have been collected. Can generalizations be made? Does a mechanical invention such as the elevator portray common aspects with a social invention such as higher education for women in their impact on society? Is a conceptual pattern of the social impingement of these inventions deducible?

These are the questions and problems that have to be answered in attempting to generalize about the findings. Gratifyingly, they need not remain unanswered. For, we were able to classify our findings into types of interrelations and to discern general processes involved in the social functionings of these inventions.

In dealing with the influences of inventions on society, some writers have pointed out that social change is the result of individual and psychological factors rather than the result of inventions. R. M. MacIver has said that the social process, and particularly social change, comes about as a result of the active participation of individuals, consciously and intelligently ad-

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Morris R. Cohen, "Method, Scientific," Encyclopedia of Social Sciences (New York: The Macmillan Company, 1937), X, 390.

justing themselves to environmental changes (inventions) rather than as a result of the passive adaptations of human beings to external forces.² Whatever one's point of view, it should be quite obvious that inventions may be considered as necessary, though not sufficient conditions of social change. It will be pointed out that "response" (which is involved in the notion of volitional behavior) is one of the immediate processes and influences involved in determining the social consequences of inventions. In fact, the problem of social adjustment to inventions involves three general avenues of inquiry: the social response to the invention which determines and precedes its adoption, the types of processes in operation, and the types of influences resulting.

In general, the relation of social change to inventions may be thought of from the standpoint of primary and derivative influences.³ By primary influences are meant those immediate results brought about by the first contacts that an invention makes with an individual, a number of individuals, or a group. By derivative influences are meant the changes that occur in a series of events following each other as links in a chain.

The study singles out two types of immediate influences, immediate social influences and immediate intentional influences. The former consists of the immediate effects an invention has on the attitudes, habits, and customs of a number of individuals or groups. It involves three further aspects which can be characterized by the concepts of response, adoption, and natural consequence.

It was mentioned previously that the influence of an inven-

²R. M. MacIver, Society: Its Structure and Changes (New York: Farrar and Rinehart, 1936), pp. 525 ff.

³The writer is indebted to W. F. Ogburn for these concepts.

tion on society is a function of the degree of its adoption. The extent of adoption determines the degree of social change, because to the extent that society adopts an invention--to the extent that an invention spreads through and is used by the members of a group--to that extent it has changed the mode and content of the life of the group from its previously existent, pre-adoptive state. The adoption of an invention adds to, replaces part of, or supplements the culture of a society.

Adoption may be understood from the standpoint of the horizontal spread of the number of units of an invention and from the use that is made of the invention. Thus the use made of the elevator is that of vertical transportation; that of higher education for women, just what it implies.

Both "spread and use" are polar phenomena; each is a function of the other. However, the number of persons making use of an invention is very apt to be greater than the number of units of the invention that were adopted. Thus the number of persons using the elevator for vertical transportation greatly exceeds the number of installed elevators; the number of women receiving a higher education is far greater than the number of colleges admitting women.

Furthermore, not only may use be thought of quantitatively--the number of users--but an invention may be used for various purposes. The varied uses that are made of an invention usually depends on the minor improvements or alterations that are appended to the invention without altering the fundamental nature of the invention. (Invention is here used synonymously with invention-combination elucidated in first chapter.) Thus elevators are used in department stores, hospitals, and warehouses. Each use required a slight variation in the elevator. Higher education for women may be used for professional or vocational preparation, for a general

liberal education, or as a medium for propaganda. Here again each use emphasizes one or more elements involved in the invention-combination higher education for women.

In this study we have found that social adoption does not inevitably follow the invention; the advent of the inventions did not lead to immediate adoption. Adoption followed only after a favorable social response (another immediate social influence) and therefore, acceptance of the inventions. But there also arose resistance or actual opposition to the proposed and the actual adoption of the inventions. In fact, resistance may be found present in one form or another, to almost every invention. Adoption and acceptance follow after these resistances are overcome.

Several writers have attempted to isolate the reasons for resistance to the adoption of inventions. W. F. Ogburn has accounted for ten general reasons for resistance to technological innovations.⁴ Bernhard J. Stern discovered fourteen factors involved in society's resistance to medical innovations.⁵

In like manner, the two inventions described in this study met with opposition. The discoverable reasons for resistance are fewer than those isolated by Ogburn or by Stern; but several of them were found. The elevator was resisted because of the lack of knowledge regarding its operation. It also was opposed on the ground of accidents and fear for personal safety. Lastly, the fact that the elevator occupies considerable rentable space acted as-- and still does act--as an economic factor which curtails the indiscriminate spread of elevator office buildings.

⁴W. F. Ogburn, "Technology and Society," p. 15 ff. (mimeographed).

⁵Bernhard J. Stern, Social Factors in Medical Progress (New York: Columbia University, 1927).

The notion of derivative influences will be discussed in a later portion of this chapter. It may suffice to note here that since the skyscraper springs from the elevator, any social influences of the skyscraper are considered derivative influences of the elevator. Thus, any resistance to the adoption of the skyscraper may be considered a derivative social influence of the elevator. Here again, it was found that fear of the new, economic factors, questions of personal safety and health are the outstanding reasons for society's resistance to the adoption of the skyscraper.

As for higher education for women, it was indicated that vigorous opposition to its spread was due to the belief that women were unfit for strenuous education; that their health would be impaired; that they lacked the innate capacity to learn complex subject matter; that they would lose all feminine appeal and charm; and that higher education would distract them from their natural function in life--motherhood.

In the resistance to the elevator, we have what Noss termed "passive resistance,"⁶ that is, resistance which consisted of a mere refusal to accept the innovation. As for higher education for women, the resistance might be classified as "unorganized active resistance" to employ Noss's terms.⁷

John Henry Mueller, in his study, "The Automobile: A Sociological Study," reduces to three types the processes involved in society's response to the automobile: (1) ordering and forbidding (this was an attempt to expel the foreign object); (2) exhortation and ridicule; and (3) toleration, criticism, and a scientific atti-

⁶Theodore K. Noss, "Resistance to Social Innovations as Found in the Literature Regarding Innovations Which Have Proved Successful" (Ph.D. dissertation, University of Chicago, 1940).

⁷Ibid.

tude.⁸ These, he found, followed in a sequential chronological order to form what he termed an "hypothesis of the natural history of public opinion."

In the social response to the elevator there was no evidence of an attempt to eliminate it--that is, the first of Mueller's "process of response" was not present. The other two were discovered in the order expected. There was expressed ridicule to the operation of the elevator (see the response to Otis' exhibition of the working of his elevator) followed by a tolerant, objective attitude towards the elevator when various municipalities sought to minimize the possible resultant accidents by regular inspection.

Interestingly enough, the response to higher education for women manifested the same two processes as were found in the response to the elevator. First, college women were ostracized in "polite society" and were considered not "quite nice."⁹ This is similar to Mueller's idea of exhortation and ridicule. Following this expression of resistance, higher education for women advanced to the stage of "toleration and criticism." Thus the empirical evidence in this study of two inventions validates, in a qualified degree, the findings of others in their studies of social response to inventions.

It should be noted that when the inventions (the elevator, higher education for women) were clamoring for adoption, their acceptance was dependent on a rational, deliberate choice. After initial social acceptance, further adoption proceeded more or less automatically, becoming impersonal and non-deliberative.

Often, however, a retardation in the process of adoption

⁸Ph.D. dissertation, University of Chicago, 1928, p. 173 ff.

⁹See Chapter X. [This refers to the complete dissertation in the University of Chicago Libraries.]

may arise after the invention has successfully spread. Thus the skyscraper met comparatively little resistance at the outset. After it became rather widely adopted, resistance arose which retarded its spread. This took the form of zoning laws, realization that unlimited height had economic drawbacks, and so on.

The spread of higher education for women gave no apparent sign of retardation even though new resistances came to the fore from time to time. However, although the figures indicate a steady increase in the number of college women, they do not of course mean that there was no retardation. New resistances were manifested. Whether they actually retarded the further adoption of higher education for women is, in this case, indeterminable.

So far we have characterized the immediate social influences of an invention as consisting of social response (involving resistance and acceptance) and social adoption (involving spread and use). Now the use of an invention may give rise to unplanned-for results that might be termed natural consequences. By natural consequences are meant those effects that spring from the use of an invention that are not premediated or planned for. No individual creation or origination is involved and no inventive activity is necessary. Thus elevator accidents were the natural accompaniments of the elevator's use. In the same way, skyscraper apartments are free from certain disease-carrying insects. Similarly the natural consequence springing from the invention of physical education for women is healthier women. These are not inventions (healthier women, freedom from insects, accidents); they are inevitable consequences of particular inventions. Since use is one aspect of adoption and since a natural consequence springs from the use of an invention, it can be seen that a natural consequence constitutes a third kind of immediate social influence.

It was stated previously that there are two types of immediate influences, social and intentional. The former has been elaborated. With respect to the latter, we have an immediate intentional influence when an invention exerts an influence on other inventions which in turn may have social consequences.

Intentional influences may occur through the operation of several processes. One such process is that of fusion. Here, several inventions combine with other inventions to produce an altogether new invention--the elevator, structural steel, water pressure inventions, all fused to form a skyscraper. Each of these inventions loses its identity, in a sense, and becomes part of a larger whole. The resultant invention then gives rise to social influences by manifesting processes of social response, social adoption, and by leading to possible natural consequences.

Second, a number of inventions may groove or jointly participate in exerting social influences. This forms an invention-configuration (discussed in the first chapter) which when adopted tends to produce its effects on society. Thus the skyscraper which resulted from a fusion of inventions, grooves with many other inventions such as transportation, centralization of industry, and so on, to form the urban invention-configuration. Higher education for women, woman suffrage, feminism, groove to bring about social equality of women.

Whenever there is a grooving of inventions, there occurs a reciprocal re-enforcement of the adoption of the inventions which involved in the grooving may re-enforce a participating invention whose use gives rise to a natural consequence: for example, the use and spread of birth control inevitably makes for more infrequent conception. But another invention such as tall apartment buildings or college education for women, although not directly

responsible for small families, can act as a re-enforcement of another invention (contraception) making its use and adoption more widespread and consequently acting as an influence for smaller families.

At the very outset of our analysis the influences of inventions were classified as primary and derivative. It is now clear that the primary influences include:

A. Immediate social influences.

1. Response.

(a) Resistance.

(b) Acceptance.

2. Adoption.

(a) Spread.

(b) Use.

3. Natural Consequences.

B. Immediate intentional influences may involve:

1. Fusion.

2. Grooving.

3. Re-enforcement.

These are all immediate or primary influences because they flow directly from the focal inventions, the elevator and higher education for women. There are however, intentional and social influences that may be thought of as being several "orders" or steps removed from the focal inventions. Thus the skyscraper which results "immediately" from a fusion of the elevator with other inventions can be characterized as an immediate intentional influence of the elevator. Living in the upper stories of skyscraper apartments has a natural consequence freedom from disease-carrying insects. Hence freedom from disease-carrying insects which is an immediate natural consequence of living in skyscraper apartments is in turn

a derivative natural consequence (and social influence) of the first order of the elevator.

Furthermore, small families are a natural consequence of the use of contraception. It was found that living in skyscraper apartments re-enforces the use of contraception. Ergo, the small family which is the immediate natural consequence (an immediate social influence) of the use of contraception is a derivative natural consequence of the first order (a derivative social influence of the first order) of the use of the skyscraper dwelling (an immediate intentional influence of the elevator) and a derivative natural consequence of the second order of the elevator.

The same type of derivative influences were found to operate in connection with higher education for women. For example, low fertility is a natural consequence of a late marriage age. College education for women tends to postpone marriage to a later age. Thus, low fertility is a derivative natural consequence of the first order of higher education for women.

If we allow I_1 to stand for our focal invention and I_2 and I_3 for inventions derived from I , the diagram on the next page portrays diagrammatically, the above discussion.

Finally, we have found what might be termed a reversible-derivative process. Primary or immediate consequences of invention A consists of (1) the adoption (including response and natural consequence wherever present) of invention A, and (2) the new invention B springing from invention A by any of the above mentioned processes. A derivative social influence (of the first order) of invention A may be the adoption of invention B. If B leads to invention C, the adoption of invention C would be a derivative social influence (of the second order) of inven-

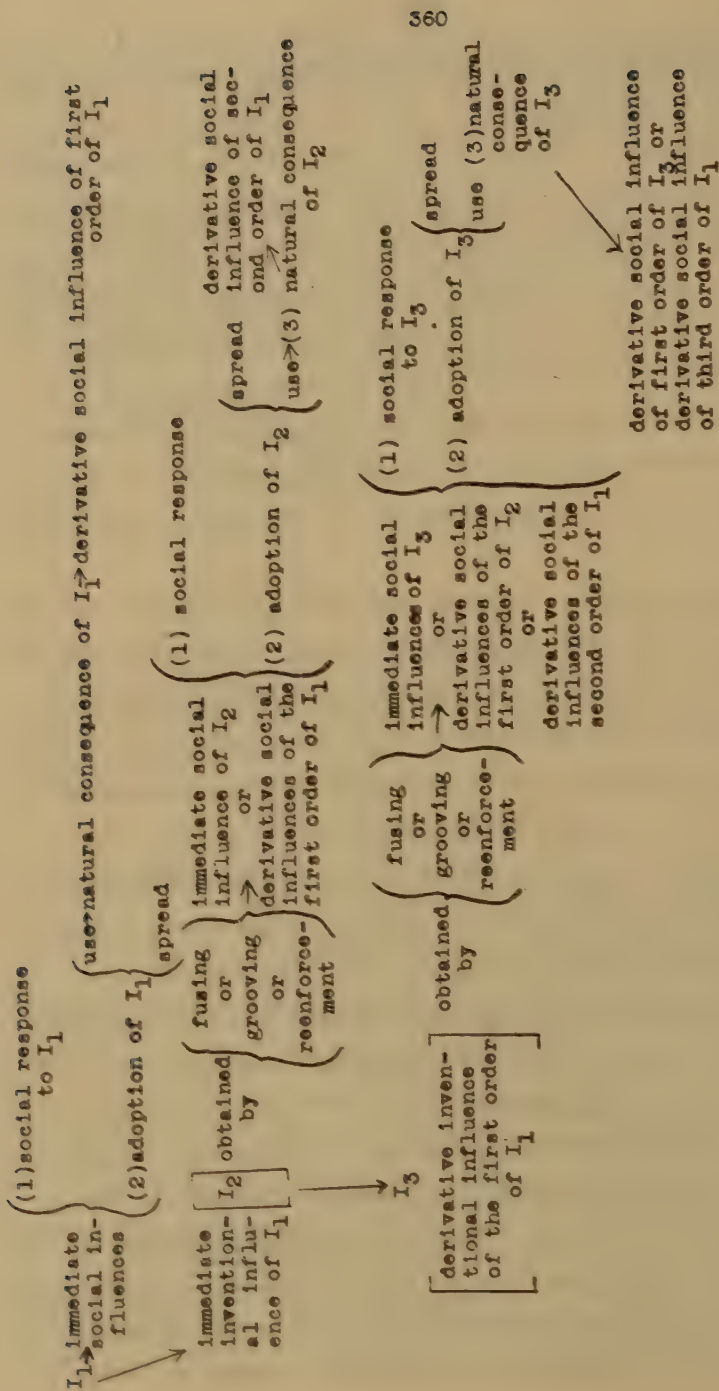


Diagram of Derivative Influences

tion A, and so on. A derivative-reversible process consists of a derivative invention, which, when adopted tends to enhance or stimulate the spread of a prior-existing invention. Thus, the elevator led to tall buildings (skyscrapers) which increased land values.

In conclusion, we wish to cite two additional types of influences found in the study: transient and permanent. This distinction is based on the duration of the influence involved. It was clearly seen in the text that the opposition to the adoption of the elevator as well as the opposition to the adoption of higher education for women was relatively short-lived as compared with some of the lasting influences of each invention. The opposition to each invention has virtually disappeared. But while it existed it took on very concrete and meaningful manifestations. We can signify this influence on relative short duration as a transient influence.

In contrast to transient influences, we have permanent influences--those that are relatively lasting in point of time. The elevator has come to stay. Higher education for women is becoming increasingly widespread and there is little reason to think it will disappear.

Mechanical inventions and their influences on society have been studied to some degree. Many aspects of this problem have been recognized, written about, and discussed. Social inventions on the other hand, have been neglected to a great extent. Noting this unplowed field of social exploration, the writer selected a social invention along with his mechanical invention in order to see whether this neglect has been justifiable. In tracing out both these inventions, it was observed that they gave rise to very similar processes of social impingement. Indeed,

the social invention seemed to have had a widespread consequences as the mechanical invention. This opens an interesting field for speculation as well as research since the emphasis has largely been upon the effects of mechanical invention on society.

These facts, concepts, and processes were discovered in the study of the impact of a mechanical invention (the elevator) and a social invention (higher education for women) on society. Whether these findings are characteristic of all inventions awaits further detailed study. The writer believes that many of these processes will be found in society's adjustment to most inventions. It seems clear that if a body of data were built up on the relation of invention to social change, vastly significant information in regard to society's functionings would be deducible.

